Advice note 10 – For silver the risk assessment for ionic form would also be adequate for ENPs

Advice notes to answer the big five questions

NanoFATE has identified five "Big Questions" important to our understanding of the ecotoxicology of engineered nanoparticles and will help provide key information required to assess the risk that these materials may pose to the environment.

This advice note is in response to the question:

Is the accuracy of today's risk assessment for 1st generation NPs sufficient to assess the risk that these materials may pose?

Rationale & Methods

NanonFATE has prepared new species sensitivity distributions (SSDs) for nano Ag, ionic Ag, nano ZnO and ionic Zn based both on literature and NanoFATE's own data. SSD is a statistical method, which plots the cumulative distribution of sensitivities of organisms against the concentrations causing e.g. no observable effects (NOEC), or 10% or 50% effect on a sublethal endpoint (EC10 or EC50). From the SSD, the 95% lower limit is estimated, which then should be protective for at least 95% of the species in an ecosystem. This HC5 (Hazardous Concentration to 5% of the species) is either taken directly as the PNEC, or it is divided by an AF of up to 5 (ECHA, 2008), depending on the type and quality of the SSD. For instance, when the SSD is based on EC50 values, a higher AF will be taken than when it is based on NOEC or EC10 values. The ETX 2.0 programme developed by the National Institute for Public Health and the Environment (RIVM) in the Netherlands (Van Vlaardingen et al., 2004), a user-friendly tool, was used to calculate the SSDs if sufficient data were available.

Results & Conclusions

For nano Ag toxicity the lowest HC5 (concentration at which 95% of species in an ecosystem would be unaffected) was 2,260 ng/L. For ionic Ag the toxicity HC5 was 324 ng/L. Thus, this evidence indicated nano Ag was not more toxic than the ionic species (Fig. 1). In both cases the most sensitive species were bacteria and then *Daphnia*. However, the most sensitive end point HC5 in freshwater toxicity tests was feeding trait which was 130 ng/L for nanosilver and 840 ng/L for ionic silver.

More information can be found in our report [NanoFATE Deliverable 6.5: Briefing note detailing approach for generation of SSD distributions; includes for CeO2, ZnO and Ag in dissolved metal ions and ENP forms.]

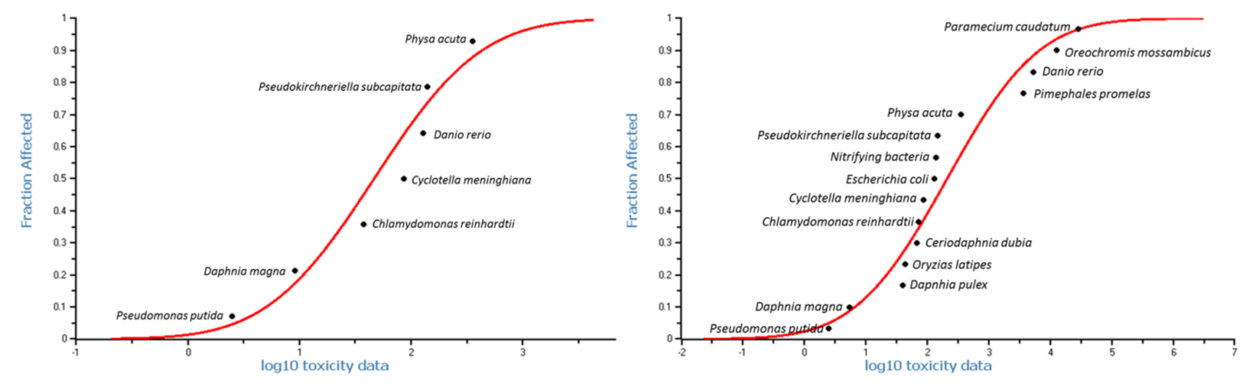

Fig. 1- Species Sensitivity Distributions (SSD) based on data on the toxicity of Ag ENPs to fresh water species using EC_{50} values from the NanoFATE project (left) and from the literature combined with the NanoFATE data (right). The EC_{50} values on the X-axis are given in µg Ag/L.

References

ECHA 2008. Guidance on information requirements and chemical safety assessment Chapter R.10: Characterisation of dose [concentration]-response for environment. European Chemicals Agency.

VAN VLAARDINGEN, P., et. al. 2004. ETX 2.0. A program to calculate hazardous concentrations and fraction affected, based on normally distributed toxicity data. Bilthoven, The Netherlands: National Institute for Public Health and the Environment.

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